

## Connecting to the Future

estimated that 11 percent of laboratory tests must be reordered because of lost results, 30 percent of treatments ordered are not documented, 40 percent of diagnoses are not recorded, and medical records are unavailable during 30 percent of patient visits.<sup>18</sup>

Sending x-rays electronically would reduce the number of images misplaced in transit. Dramatic savings can also be realized in transportation costs, as has been done, for example, through New York Telephone's patient-image-transfer system, which links the jails on Rikers Island to Bellevue Hospital. Underserved areas will be able to receive better healthcare through two-way, interactive video consultation, which can provide patients with access via remote to medical experts.

Access to information on demand will enhance effective disease prevention, health promotion, and medical treatment. A personal health information system comprising an individual's lifetime health record, databases containing the most current health science, and a query capability to address questions and concerns will help individuals become informed consumers better able to take responsibility for their own health. Of course, linked networks of patient health records will need security processes that maintain the confidentiality of patient data.

Interactive telecommunications can make possible a wide distribution of health information and decision-making tools. With the use of advanced multimedia interfaces, barriers to access by low-literacy individuals and persons with disabilities can be reduced.

### SOCIAL INCLUSION

The telecommunications revolution creates an opportunity to bring many now marginalized groups into the center of economic and social life. Closer links between schools and workplaces will help young New Yorkers—regardless of race, geography, disability, or income—develop the skills needed to join the workforce. Through telecommunications new opportunities for lifelong learning will become available to people who lacked ready access in the past. Further, New York can take advantage of experienced teachers and health care workers that have been able to communicate with metropolitan centers. For example, the Rural Health Networking Project links 14 hospitals and clinics in medical image transfer and remote diagnostic work. The Western New York Health/Sciences Cooperative Network links together eight large teaching hospitals in Buffalo and the SUNY-Buffalo Medical School. This high-bandwidth network allows for the transfer of medical images and records and offers computerized medical database search capabilities. In Austin, the Texas Telemedicine offers interactive video consultation to primary care physicians in rural hospitals. This helps offset the scarcity of specialists in that state's rural areas.<sup>19</sup>

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#### TELECOMMUTING: PRODUCTIVE AND ENVIRONMENTALLY SOUND

Telecommuting has the potential to increase economic efficiency and provide major quality-of-life improvements. A 1991 study by Arthur D. Little estimated that if 10 to 20 percent of commuting, business travel, shopping trips, and paper information transport were done by telecommunications, the United States would have saved \$23.2 billion in labor productivity, energy, pollution, and transportation infrastructure maintenance costs in 1988 alone.<sup>20</sup> These savings far exceed those expected from other improvements in the transportation system.

*We can use telecommunications to better serve the public.*

This potential is already being realized. A recent study estimated that there were 6.6 million telecommuters nationwide in 1992, up 20 percent from 1991, and that the number of telecommuters is growing faster than any other kind of home worker.<sup>21</sup> Another study on the New York area concluded that both employers and employees benefited from telecommuting. Telecommuters reported that their morale and outlook about their jobs and employers improved, while employers felt that telecommuting had positively influenced worker productivity.<sup>22</sup>

The need to comply with the Federal Clean Air Act amendments of 1990 has already stimulated telecommuting programs in New York, New Jersey, Connecticut, and Texas. The act mandates that businesses with 100 or more employees in urban areas with poor air quality moderate the use of cars by employees. New York State's Clean Air Compliance Act requires the implementation of an Employee Commute Option program by all public and private employers in the state's severe nonattainment area, specifically New York City, Long Island, Westchester and Rockland Counties, and seven towns in Orange County.

#### THE PUBLIC SECTOR: GETTING VALUE FOR TAX DOLLARS AND ENHANCING THE DEMOCRATIC PROCESS

The tendency to employ new technologies first to improve old processes has led New York's public sector to concentrate its use of telecommunications on such use of them. The potential benefits of modern telecommunications are much greater.

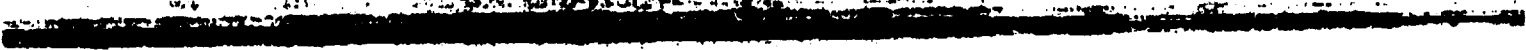
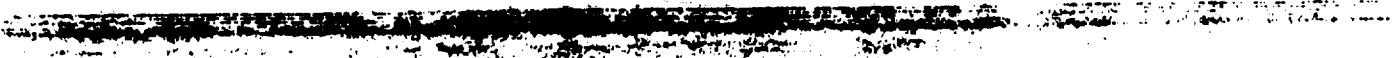
A complementary strategy would emphasize the use of telecommunications as a way to better serve the public. For example, state laws, economic statistics, and agency reports and studies could be made widely available through electronic bulletin boards. So-called accessible information kiosks could help New Yorkers acquire information on property taxes, restaurant violations, and water rates without going through the usual red tape and cumbersome procedures. In California such kiosks are widely available in libraries, shopping malls, and other public spaces. Residents use them to renew vehicle registration, register for employment openings, and get information on 90 different subjects ranging from applying for

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student loans to resolving tenant-landlord disputes. The kiosks have reportedly reduced the cost of job-match services from \$150 to \$40 per person.<sup>23</sup>

Procurement policies can also indirectly help New York extend its telecommunications advantage. Government's purchases can represent a significant portion of initial demand for new capabilities, reducing the risk of deploying new products by providing suppliers a base on which to build their market.

In addition, telecommunications can help promote the democratic process by providing citizens with the widespread, decentralized dissemination of information and ideas. Providing easy access to this information can help New Yorkers understand and make intelligent decisions about issues that affect the state and their lives. Accessible public networks can help ensure a democratic system and encourage greater participation by providing for openness. At the same time, they can provide guidance and feedback to political leaders about the values and attitudes of their constituents.



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## 2. New York's Telecommunications System: Staying Ahead

New York possesses a quality telecommunications infrastructure. New York City, particularly Manhattan's central business district, has access to the most advanced telecommunications services in the world. Other parts of the state, including rural areas, are served by increasingly modern telecommunication networks. Generally, New York's current telecommunications infrastructure satisfies existing needs and compares favorably with those of other states. Two important challenges face policymakers: ensuring that the state's telecommunications system continues to provide New York businesses with a competitive advantage, and making sure that top-line telecommunications services are available throughout the state.

New York is composed of many telecommunication users, from upstate farmers to inner-city students to suburban managers of global corporations. This diversity is one strength of New York's system. A second part of the system is the telecommunications infrastructure itself: the thousands of miles of copper, coaxial, and fiber cables; the microwave broadcasting and receiving stations; and the banks of switches and computers that route calls. Telecommunications providers—the competing telephone, cable, and wireless companies—are a third element of the system. A fourth set of components consists of applications—the programs and processes people use to meet their telecommunications needs. The last part of the system is the body of rules governing the relationships between the parts. Some rules are conventions agreed upon by providers and users, while others are federal and state regulations. This chapter focuses on the ability of the various parts of the system to meet the emerging needs discussed in Chapter 1.

### A Profile of the Industry's Providers

More than 275 companies offer a wide array of telecommunications services to New Yorkers, including: local telephone service, long-distance calling, lines for private networks, public pay phones, operator services, and mobile telephone services. The array of telecommunications companies operating in New York forms a web of facilities and services. For customers, the center of the web is their local exchange company, which provides local access lines that connect to the network. The local exchange company also connects the public to other service providers, such as long-distance companies.

### LOCAL EXCHANGE CARRIERS

There are 40 local exchange companies in the state, ranging from New York Telephone Company—a statewide presence, with 1992 revenues of over

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\$7.5 billion and more than 9.8 million access lines—to Oriskany Falls Telephone Corporation, located in rural Oneida County, with 1992 revenues of \$487,019 and 719 access lines.

**INTEREXCHANGE CARRIERS**

There are 25 companies certified to operate in New York's competitive interexchange market. Three of these—AT&T, MCI, and Sprint—offer long-distance service throughout the state. The remaining interexchange carriers serve limited geographical areas; nevertheless, they provide their customers with calling services to any point on the globe.

**CELLULAR TELEPHONE**

Cellular telephone service uses radio-based transmission technology to provide mobile telephone service. The cellular industry has grown dramatically in recent years, and most observers foresee continued robust growth. Today there are 30 authorized cellular carriers, with two carriers competing in each service territory of the state (with one exception, a territory that currently has only one carrier). The decision by the Federal Communications Commission (FCC) to auction additional portions of the airwaves will mean an increase in the number of wireless carriers and more competition.<sup>24</sup>

Infrastructure enhancements by the cellular industry have been aimed at improving service quality and increasing system capacity throughout the development and deployment of digital technology. With digital transmission, cellular system capacity may ultimately increase over ten-fold, making wireless services more available and affordable to greater numbers of consumers. Infrastructure investment has also facilitated the introduction of innovative new services to the public, including cellular packet data, wireless fax services and voice-activated dialing.

**RESELLERS**

Resellers often conduct business by buying services from carriers at wholesale rates and then reselling the services to their own customers. By aggregating the demand of lower volume customers, resellers can profitably provide competitive retail rates. In some cases they add value to the underlying services by packaging them with their own services or features. More than 180 resellers currently offer telecommunication services in New York.

**OTHER LOCAL CARRIERS**

Two other types of firms also compete for local customers. Shared tenant service providers sell "local" service on a very limited geographical basis, usually within a building or complex, and offer calling to points outside their systems by reselling the services of local exchange and interexchange

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carriers. Competitive access providers (CAPs, or alternative local transport providers) typically construct fiber-optic networks in metropolitan areas, offering competitive connections between a limited number of customers or between customers and interexchange carriers. Competitive access providers may also compete by providing connections between customers and local exchange companies, improving reliability. Finally, they can link local telephone company central offices to long-distance carriers.

### THE CABLE INDUSTRY

By 1991 the New York cable industry had placed cable near almost 5.5 million homes and was serving almost 3.5 million basic subscribers—more than half the households in the state. Although 73 companies operate 258 cable systems and 1,441 separate franchises have been awarded to cable operators by municipalities, the industry is dominated by a handful of large multiple-system operators. The 10 largest companies served 85.2 percent of all subscribers with basic service in 1991. In a subsequent section we will see that many cable companies are now pursuing mergers and partnerships with telephone and entertainment corporations.

### PUBLIC SECTOR NETWORKS

Seven major statewide networks serve parts of the public sector, often in an uncoordinated or redundant fashion. The Departments of Social Services, Motor Vehicles, and Labor, and 24 other state agencies use EMPIRE NET, one of the largest networks in New York. Another data network, CRIMNET, assists New York's state, city, and town police forces, courts, and corrections officials. CRIMNET gives these agencies access to the data of federal agencies such as the Federal Bureau of Investigation.

Statewide networks also enhance education in New York. Currently, the State University of New York operates two television networks, called New York Network and SUNYSAT. Both provide educational TV programs to Public Broadcast System stations in the state. In addition, they use a satellite system to send high-quality television signals to all 64 SUNY campuses and other locations. SUNYSAT is also employed for video teleconferencing across the state—and around the globe. A fifth network is SUNYNet, which links the administrative, academic, and library services of the 64 campuses. NYSErNet serves hundreds of universities, colleges, research facilities, and school districts, providing them with access to the worldwide Internet. Finally, the State Education Department operates Technology Network Ties to serve both academic and administrative needs of school districts across New York. In the Albany area, the state government operates CAPNET, a local exchange network for government agencies. With 35,000 access lines, this network serves a considerable portion of the Albany area.

New applications for education could be developed in cooperation with public radio and television networks. Public television and radio are

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resources that could be integrated with the education agenda in the information age. New York's public broadcasting stations are chartered by the state's Board of Regents and have nearly 30 years of experience in using all forms of telecommunications technology for teaching and learning. Educational products and services include not only traditional instructional broadcast programming, but also program guides, teacher guides, textbooks, trade books, and interactive multimedia software as well.

**New York's Telecommunications Inventory: Poised for the Next Step?**

Telecommunications technology is developing rapidly, but development is only the first step in the process of diffusion. Often, a new technology may wait years before it can be economically deployed on a widespread basis, either because existing technology continues to satisfy demand or because sufficient demand for the innovation has not appeared. The pace at which new technologies are deployed depends on cost, corporate strategy, consumer needs, the mastery of new skills by users, and public policy. Some ideas in the laboratory today may be vital elements of tomorrow's network; others may never find profitable application.

Several telecommunications technologies are now much discussed. Digital switches are being deployed because they are cost-effective, fast, efficient and can be easily upgraded. A new network signaling system, Signaling System 7 (SS7), is being deployed to better route information flows through networks and to enable providers to offer new products like caller identification services. Fiber-optic lines, which provide very high transmission rates, are being placed where the investment can be recouped. Integrated Services Digital Network (ISDN) facilities, one way to provide digital transmission and signaling capabilities directly to customers, at speeds ten times greater than currently available, are beginning to be deployed in a significant number of central offices.

At the end of 1992, 73 percent of New York Telephone's switches were digital, and the company served 68 percent of its access lines with digital switches. Compared with the other regional Bell operating companies and to New England Telephone, New York Telephone has the highest percentage of digitally served access lines. Moreover, 95 percent of the access lines of New York's "independent" local exchange companies were also served by digital switches, and all are expected to be digital by 1998.

By the end of 1992, New York Telephone provided SS7 capability to 57 percent of its access lines, slightly below the average of the other Bell operating companies. The company expects all of its switches to be fully capable for SS7 by the end of 1998. The "independents" served approximately half of their access lines with SS7 at the end of 1992, and expect that figure to rise to 86 percent by 1996.

Since fiber-optic transmission facilities are relatively more economical where high capacity is required, fiber has been deployed primarily between

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network switches (interoffice trunks) and more recently along the "feeder" routes that serve large concentrations of customers. New York Telephone has placed 520,000 miles of fiber cable in the public switched network, more than the average of regional Bell operating companies. About 75 percent of New York Telephone's interoffice routes are now optical fiber, a number the company expects to raise to about 90 percent by 1995, and to 100 percent by 1998. The "independents" have fiber in about 60 percent of their interoffice routes and expect that figure to pass 80 percent by the end of 1993.

Most cable TV systems include some fiber optics, and much of that fiber cable has redundant, unused strands. This "dark fiber" could be used for other transmissions. New York's cable TV network includes more fiber cable than those of most other states and has the potential to be a highly valuable component of the future telecommunications infrastructure.

Narrowband ISDN can be implemented with existing copper loops, and allows the reception of higher-quality graphic, data, and videotelephony services. Its proponents regard it as a cost-effective interim measure for extending digital transmission capabilities to individual customers.

ISDN access can be obtained in two forms: basic rate ISDN and primary rate ISDN. Basic rate ISDN speeds (up to 144 kilobits per second) are an order of magnitude greater than those possible with today's typical analog access (not much over 10 kilobits per second). It can bring reasonable quality video, data transport including graphic displays, and high-speed fax communications to a home, office, library, or school. Primary rate ISDN can go a step further (speeds of about 1500 kilobits per second) and can support several simultaneous users or support better-quality video.

At the end of 1992, only about 5 percent of New York Telephone Company's lines had access to ISDN capability. However, the company expects to make ISDN service available to about two-thirds of its access lines by the end of 1993 (about equal to the average of the other Bell companies). Most of the independents do not have ISDN capability and expect to offer it to less than 20 percent of their lines by 1995. Rochester Telephone Company, on the other hand, gives two-thirds of its customers access to ISDN. Competitive access providers, whose networks are generally newer, usually have greater deployment of these four technologies and standards.

New York's telecommunications systems meet most of today's needs. With the pace of technical change quickening and competition sharpening the world over, telecommunications needs will evolve rapidly. States and countries that can best satisfy the demands of telecommunication users will attract more investment in the coming information age, leading to superior competitiveness and stronger economies. The question, then, is how to develop telecommunications policies that will ensure that New York's system continues to provide the best services available in the exciting times ahead.



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### 3. A New Policy Framework for a New Telecommunications System

Realizing the dynamic potential of telecommunications to better serve the people of New York is the challenge facing state and federal policymakers. The policies they adopt will affect the prices New Yorkers pay, the range of the services they have access to, and the quality of their services. Sound policies can improve New York's quality of life and the competitiveness of its workplaces.

#### A Shift in the Regulatory Framework

Historically, regulators focused on the provision of universal access to basic service at affordable prices through detailed regulation of telecommunications prices. Economic growth was not an explicit goal for policymakers during most of the post-World War II era. As AT&T was the technologically preeminent telecommunications provider in the world, companies located in the United States had access to the world's best network. At the same time, American corporations dominated their global rivals and located much of their production and research within U.S. borders.

The economic era since AT&T's divestiture is a competitive era in two ways: both within the U.S. industry and across the world's businesses. First, competition *within the telecommunications industry* has increased dramatically. For much of this century, the telephone network consisted of a collection of companies, each enjoying a government-regulated monopoly in its particular territory. Interconnections between companies and with AT&T's long lines department enabled them cooperatively to provide calling between any two customers on the network. Similarly, the cable television industry has been characterized by individual companies generally enjoying monopolies within local franchise territories, subject to governmental regulation. Since the 1960s, technical and regulatory changes have made possible competition between providers in many segments of the telephone network, including customer premises equipment, long distance, nonswitched private lines, and wireless communications. Today, although competition has not fully developed in all markets, such as virtually all local residential exchanges, alternate operator service providers, and customer-owned currency-operated telephone providers, every element of the network is potentially subject to competitive provision. In the cable television market, recent actions in Congress, the FCC, and the federal courts presage greater competition. Add to these more traditional "public" networks an untold number of private business and government networks, dozens of cellular, alternative local access, and interexchange carriers, plus emerging technologies and carriers for portable, personal communications, and it becomes evident that New York's future telecom-

*Competition within the telecommunications industry has increased dramatically.*

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munications system will be a competitive, multiprovider network of networks.

The state's regulatory policies should reflect the fact that significant consumer choice exists in the interLATA interexchange telecommunications marketplace. New York State has already made significant progress in ensuring full competition in this market and should now, in view of marketplace changes, re-examine whether the concept of dominance has any continued relevance and whether all providers of services in this market should be afforded equal regulatory treatment. Competition, along with regulatory freedom, has stimulated innovation and given customers more choices, better service, and lower prices.

Second, the 1980s were an era in which *global competitiveness* became a paramount issue. America's trade deficit widened, and imports took much of the domestic market in high-technology sectors, including televisions, computers, and telephone equipment. America's competitiveness problems contributed to stagnating American standards of living. As the Clinton administration has recognized, a modern telecommunications infrastructure will "enable U.S. firms to compete and win in the global economy, generating good jobs for the American people and economic growth for the nation."<sup>25</sup>

*Competition has  
stimulated innovation.*

The Clinton administration has committed itself to a new telecommunications agenda. Like ours, its agenda relies on private investment to build the nation's information highways. Washington's infrastructure modernization roles include providing a tax and regulatory climate that encourages private investment and providing funding for research and pilot projects. The Clinton administration has promised to extend the principle of universal service, ensuring that all Americans have access to information resources at affordable prices. In addition, Washington is promoting seamless interconnections of networks and fostering the development of applications, particularly among healthcare providers, school districts, libraries, universities, government agencies, and other nonprofit organizations. Finally, the administration is committed to using advanced telecommunications to help reinvent government.

## Reconsidering Policy Goals in the Competitive Era

The Exchange believes that New York's policymakers should now be guided by six primary goals:

- *Accelerate economic growth:* Although this has not been an explicit regulatory concern in the past, New York policymakers must now view a modern telecommunications infrastructure as a vital precondition for robust economic growth, which in turn creates jobs. Growth depends on the private and public sectors making needed investments in equipment, in the development of new technologies,

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and in human skills. In part because of the dramatic expansion of computers and microprocessors, New York businesses have become more dependent on rapid, high-quality communications with their customers, suppliers, and other units within their own organizations. Without the availability of an advanced telecommunications infrastructure, the competitiveness of New York companies will suffer, and they will be likely to move operations—and jobs and new investments—to other locations. Policymakers also need to ensure that the growth of the economy translates into growth of “good” jobs—that require skills, pay decent wages, and offer benefits.

- *Provide quality service:* Regulators should promote fair, open competition between providers and seamless interconnection for users. Where competition is in place, regulators should adapt to this new environment and eliminate all unnecessary asymmetric constraints. As the telecommunications industry becomes more competitive, policymakers must ensure that consumers continue to have affordable access to modern services, must maximize users’ ability to choose telecommunications and information service providers, and must protect consumers by periodically establishing service standards for all providers of intrastate telecommunications services. Service quality is a broad concept that necessarily changes with technological advances and evolving standards. Standards are essential to ensure reliability and disaster resistance and to maintain privacy and other consumer protections. The New York Public Service Commission has committed itself to universal service, high service quality, avoidance of rate shock, privacy protection, and maintenance of a forum to resolve consumer concerns.

*Regulators should  
promote universal  
service, access,  
and seamless  
interconnection.*

- *Promote social inclusion and universal service:* Federal and state regulators have in the past ensured that access to basic telephone service was universally available, regardless of age, race, geographic location, or income. At the federal and local level, cable regulators ensured public access to cable television. In the future, a commitment to social inclusion will mean guaranteed universal access to an evolving set of basic services, affordable pricing for those services for all users, and broad availability of more sophisticated services (with consideration of the effects of prices) throughout New York’s businesses, homes, schools, healthcare providers, and libraries. It will mean that telecommunications policies recognize the needs of special groups, such as the economically disadvantaged, non-English speakers, minorities, the elderly, and persons with disabilities. Also, policy will need to recognize the contributions that minority- and women-owned businesses can make to

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New York's telecommunications system, both as users and providers of services, and their need to access modern, sophisticated services. By widening markets, policies of inclusion also will enhance the economic value of the network.

- *Enhance the quality of life for all New Yorkers:* Modern telecommunications can make New York a more desirable place to live, in part by enhancing the dynamism of the state economy and the efficacy of our educational system and the provision of healthcare. All New Yorkers should have the opportunity to master the skills they need to participate in our technologically advanced society. New services will allow New Yorkers to simplify routine personal activities such as shopping, getting information, and managing finances. Entertainment companies will be able to offer a vast variety of programming.

*Public policies should foster research and innovation in the telecommunications industry.*

- *Foster innovation to bring enhanced services to New Yorkers:* During the monopoly era, AT&T maintained what were perhaps the world's preeminent research laboratories, producing, among other notable inventions, the transistor—the indispensable building block of the telecommunications revolution. In the new era, the development and diffusion of new technologies, products, and services will be much more decentralized, and public policies should foster research and innovation in the telecommunications industry and in information-using industries.

- *Strengthen democracy and individual rights:* Finally, telecommunications can strengthen and nurture democratic values, including free speech and participation. The First Amendment to the Constitution protects freedom of speech, freedom of the press, and the right of people to peaceably assemble. New York policymakers need to consider how First Amendment rights will be protected in this new electronic environment. The free flow of information and ideas can empower citizens to make state and local governments more responsive to the public's needs. To this end, policymakers need to ensure that users have a wide choice of providers of information services and the means to access those information services. At the same time, the right of individuals to privacy must be protected. Policies to prevent the erosion of privacy in the wake of the introduction of new telecommunications technology, equipment, and services must continue to be strong and clear. Telecommunications hardware and software developers, service providers, and the public all benefit when confidentiality concerns are resolved in a timely and predictable manner. Regulators should promote fair, efficient, and reasonable privacy standards, and should continue to

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develop methods for reviewing privacy concerns before the production or marketing of new products and services begins.

These goals are related. For example, economic growth and opportunity are vital preconditions for having a good quality of life. Fostering innovation spurs economic growth. Strengthening participation in civic life can make governments more responsive to economic and quality-of-life concerns.

In the new era, policymakers confront the challenge of meeting old and new goals in a different economic and regulatory environment. A new approach is needed—one that addresses the following issues.

### CONNECTING TO AN OPEN, COMPETITIVE NETWORK OF NETWORKS

The local network, like the long-distance one, is evolving into a network-of-networks structure. New technologies and a pro-competition regulatory environment have led to increased competition for certain services and market segments. Though it remains to be seen how broad and pervasive such competitive pressures will be, it appears that the network of the future will be a multiprovider network, at least for some services in some business and residential markets throughout the state.

In such an environment, a critical issue is ensuring that users and equipment can communicate and interact with each other. Without intelligent policies, a proliferation of incompatible proprietary standards and closed systems could produce the electronic equivalent of the Tower of Babel.

*The network of the future will be a multiprovider network.*

New York has already made great strides toward achieving the envisioned competitive network of networks. It was among the first jurisdictions in the nation to allow customers to provide their own telephone equipment and wiring, to eliminate resale and shared-use restrictions, to certify competing carriers to provide inter- and intracity telephone services, to adopt alternatives to traditional rate-of-return regulation, and to relax its

regulatory policies requiring open networks, defining common carrier obligations, and protecting consumers' privacy interests. Today it is at the forefront of efforts to identify and implement policies necessary to create fair and effective competition in all telecommunications markets, including the local service market, provided that universal, high-quality service is maintained.

The coaxial and fiber networks laid by the cable companies have to be considered as an important feature of the infrastructure of the network of networks. Thus, if one objective for policymakers is the establishment of a cost-effective, switched, broadband network, one issue is the potential for interconnection between the existing, switched telephone network and the unswitched, but high-bandwidth, cable network. Policies that promote

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interconnections could make possible modernization at a more affordable price. Recent corporate mergers evidently aim to explore and exploit such options.

By stimulating competition in the information-transmission sector, new opportunities will be created for competition in the development of information content. By ensuring that consumers can choose from a variety of transport providers and that common carriers transmit, at a reasonable rate, any traffic offered to them, New York can foster greater competition in information content. In this way, the state can encourage its citizens to develop and exchange a wealth of knowledge, information, insight, and ideas.

### UNIVERSAL ACCESS TO BASIC SERVICE

All New Yorkers benefit when providers operate under universal service obligations. This has been a particular concern for persons with disabilities who want to be integrated into society. According to Frank Bowe:

[A]ll [providers] should be subject to universal service obligations. Otherwise, we end up with big companies enjoying an information-rich network and the rest of us (schools, government agencies, nonprofit organizations, small businesses, and certainly residential customers including people with disabilities) are limited to an information-poor, bare-bones network. . . . That would be a first-level disaster for our community.<sup>26</sup>

*New York's policies to foster competition must reflect a continuing commitment to basic universal service.*

Market-driven competition will not bring new telecommunications services to everyone in the state at the same time. New services will reach profitable markets first. This can adversely affect the citizens and communities left behind, as well as the state's relative economic strength. Once these communities have attracted a more modern infrastructure, they have a competitive advantage relative to areas with less modern infrastructure.<sup>27</sup> New York's policies to foster competition in the industry must reflect a continuing commitment to basic universal service, including an expanding definition of such service as new services become essential to participation in the social and economic mainstream.

Traditionally, telephone service for the poor and disadvantaged has been funded by subsidies collected from other users by the monopoly provider. Advances in technology and a competitive environment are making it increasingly possible for users to find competitive choices for the local exchange companies' networks, either through their own private networks or by using the services of competitive providers, thereby avoiding the cross-subsidies of traditional carriers. The loss of profitable customers to alternative networks potentially increases the rate burden on the remaining local exchange subscribers, who do not have alternative means to access the public network. If local exchange companies raise their rates rather than lowering their costs to make up for the lost business, they may

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provide the remaining customers an additional incentive to seek alternatives to traditional carriers. Thus, without offsetting policies, the process of increasing competition may diminish the funds available to subsidize universal service. New York has taken the lead in developing new mechanisms to ensure the preservation of universal service, given the changing marketplace. It must continue to do so.

## COMMON REGULATORY AND TAX POLICIES

Technological advances are enabling the integrated provision of once distinct communications services over common facilities. Television, telephone, and information providers are all positioning themselves for entry into each other's traditional markets. Local telephone companies are entering the cable television business (in many cases outside the region in which they currently provide telephone service), while the cable industry pursues trials of full-service networks over which it proposes to offer a broad array of telephone and entertainment services. While many local exchange companies already have cellular telephone affiliates, AT&T and other long-distance carriers have recently begun acquiring or forming alliances with cellular companies. These cellular networks and other anticipated wireless networks do not yet offer a realistic alternative to wireline local exchange service, but they have the potential to do so. This technical and corporate trend toward integration of services makes it increasingly difficult to maintain traditional regulatory distinctions among various types of service providers and raises issues of equitable regulatory treatment.

An additional issue is the effect of state taxes on telecommunications costs and prices. New York Bell's operating company, NYNEX, has higher than average rates. A recent FCC study, which computed average rates and weighted the different types of users, found that NYNEX's average monthly charge for an access line, \$28.31 a month, is the second highest in the country. The national average was \$23.93 a month.<sup>28</sup>

Taxes on telecommunications providers are one reason for the high costs. A 1990 study found that local and state taxes amounted to 17.9 percent of New York Telephone's revenues, but only 7.7 percent of New Jersey Bell's.<sup>29</sup> These taxes are passed along as a cost to users, who then, if they are businesses, have to pass on costs to their customers—a spiral of cost shifting that increases the cost of doing business in New York.

## INFRASTRUCTURE MODERNIZATION AND INVESTMENT INCENTIVES

Under the monopoly provider regulatory framework, infrastructure modernization was not a difficult issue. Regulators used their rate-setting power to provide monopoly telephone companies with incentives to build the infrastructure that regulators approved of.

In the competitive era, the situation is more complicated. First, the

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number of companies is greater. Second, reducing barriers to competition helps New York attract investment. The private sector, operating in a more competitive market, will provide the state's telecommunications investments. Unlike some other states and nations that have turned investment in telecommunications infrastructure modernization over to one company, New York seeks to attract investment by many. This strategy will help expand the telecommunications capabilities available to the public by encouraging carriers to identify and efficiently satisfy consumer demand, either by themselves or in concert with other providers.

New York must continually monitor the success of its pro-competitive policies through infrastructure benchmarks that will compare not only how New York is progressing relative to other jurisdictions in the United States as well as overseas, but how well various regions and communities of New York are progressing relative to one another. Such benchmarks could form the basis for public intervention in areas where the market is not providing adequate service. Where appropriate, this intervention would address remaining obstacles that preclude competition. If in some markets monopolies reemerge, New York will need to regulate these providers.

One of the key infrastructure investment issues is the role of economic regulation. A number of alternatives to rate-of-return regulation (for example, rate moratoria, social contracts, deregulation, price caps, rate banding) have been tried in other jurisdictions across the country. The Public Service Commission, too, has employed alternatives to rate of return for regulating the major telephone companies in New York (New York Telephone, AT&T, and Rochester Telephone), and is currently seeking an appropriate regulatory framework for New York Telephone in its ongoing incentives proceeding. Properly structured economic regulation, during a transition to a fully competitive framework, should induce companies to bear the risk of their investment decisions and minimize the probability that basic service rates might insulate investors from the risk of investing in new discretionary and competitive services. Conversely, shareholders should reap the rewards of success. The effectiveness of the state's regulatory policies in producing fair and competitive markets must be carefully monitored to avoid an imbalance between the level of competition and the degree of regulation.

*Modernizing the infrastructure will result in a more competitive economy.*

### LABOR FORCE ISSUES: SERVICE QUALITY, TRAINING, AND RE-EMPLOYING DISPLACED WORKERS

Modernizing the infrastructure will result in a more competitive economy. It may also accelerate the already-evident trend of workforce reductions in the industry. One issue is continuous training for workers to cope with the changes in technology, so that their skills do not become obsolete. A second issue is making it easier for displaced workers who have valuable industry-specific skills to find new jobs with expanding firms in the industry. A third



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issue is how labor and management can work together to maintain and enhance service quality.

**USING THE EMERGING NETWORK OF NETWORKS**

A modern network of networks is necessary but not sufficient. New York must also strive to assure that New Yorkers can use the emerging network of networks to meet their social and economic needs.

At present, many small businesses are not effective users of telecommunications. Nor are many state government agencies. Many useful applications in education and health need to be further developed and diffused. Unless barriers to diffusion are identified and overcome, the quality of life for New Yorkers, as well as the state's economic growth, will be less than optimum.

Addressing these interrelated issues will require a comprehensive approach. As we will see in the following chapters, this requires policies that encourage competition when it delivers clear social benefits, that safeguard consumers when market incentives are inadequate, and that foster public-private cooperation to maximize the value of the emerging network of networks to users and potential users.

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#### 4. Connecting to the Open Network of Networks

The infrastructure of the future will consist of a series of interconnected networks, operated by a variety of service providers, yielding a broad range of benefits to consumers. Interoperability and efficient interconnection of all participating networks will be critical to the seamless operation of this infrastructure. Not only will this yield consumers a wider range of choice over who will carry their phone conversations, data transactions, and so on, but it will contribute to a broad array of choices about the information itself that they will be able to send and receive. During and after the transition to an open, competitive network of networks, regulation will play an important role in ensuring that all networks support the kinds of interconnection necessary to provide seamless services to the public. The basic principle of open network architecture is the unbundling and individual pricing of bottleneck network facilities and services—those that may prevent or constrict the delivery of information. It is essential that all common carriers offer open, reasonably priced interconnection to their networks for the transmission of telecommunication traffic. During the transition, transmission of traditional one-way programming and subscriber interaction, if any, required for the selection of programming, will not be considered common carrier service.

Open network policies must apply to both intercarrier interfaces and carrier-user interfaces. Intercarrier interfaces must be open to ensure that anyone attempting to provide information transport to the general public is able to do so and is not foreclosed by a bottleneck that does not allow delivery. Carrier-user interfaces must adhere to open standards that do not advantage or disadvantage the equipment or information product of any particular competitors but allow users to connect a wide range of specialized devices. End users must be able to put information in any form (sound, data, image) onto the network and be assured that the information will be delivered to the desired location(s) in the desired manner.

The following elements are critical to the development of the vibrant communications infrastructure of an open, competitive network of networks.

*Barriers to market entry  
should be removed  
wherever possible.*

##### Removal of Entry Barriers

Barriers to market entry—whether imposed by law, regulation, tax policy, or by the market power of dominant incumbent service providers—should be removed wherever possible. The Exchange's recommendations, described below, on interconnection and common carrier obligations, are intended to encourage competition between existing providers and new entrants into the industry, including minority- and women-owned enterprises. The Exchange also believes that all participants in the network of networks should practice open procurement policies, so that all New York

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enterprises are able to participate in, and benefit from, the new, competitive environment.

As pro-competitive policies take hold, it will be increasingly possible for small firms to challenge cable and telephone carriers maintaining monopoly power in particular service markets and/or regions. Incumbent monopoly providers should be restrained by regulatory oversight from exercising that power to inhibit the growth of new market entrants. This requires continued regulatory oversight of local telephone and cable monopolies so long as they maintain dominant market power, and freedom for cable and telephone companies to enter into each other's traditional markets, subject to careful antitrust scrutiny of proposed mergers, regulatory restrictions to prevent cross-subsidization from (regulated or unregulated) monopoly endeavors to competitive ones, and appropriate safeguards to prevent discrimination against nonaffiliated content providers. This may require separate subsidiaries where necessary to prevent abuse. All of this is vital to ensure the development and continuation of real and fair competition.

### Interconnection Policies

Interconnection policies are required to govern who must interconnect where, when, and how. Carriers can be expected to interconnect when it is in their mutual interest to do so. Regulatory intervention may be required when a carrier with dominant market power (general or situational) declines to offer reasonable interconnections. Interconnection arrangements should not be unreasonably withheld or be unreasonably discriminatory. Generally, all providers of portions of the common carrier network of ~~the United States~~ ~~are required to provide~~ ~~nonexclusive~~ ~~access to~~ ~~the~~ ~~network~~ ~~and~~ ~~provide~~ ~~them~~ ~~on~~ ~~demand~~ ~~to~~ ~~all~~ ~~other~~ ~~network~~ ~~providers~~ ~~and~~ ~~users~~ ~~who~~ ~~choose~~ ~~to~~ ~~subscribe~~. Interconnections with other carriers should be technically and economically comparable to those a carrier "provides" ~~itself~~.

There must also be physical and logical interconnection standards—technical standards normally established by industry standards organizations at the national or international level. The state's primary role will be to encourage timely agreement on fair and efficient standards; it may (rarely) require a more active role in developing or imposing standards, either as a user or as a regulator.

Users require compatible network addresses, e.g., telephone numbers, in order to be reached by other users on any interconnected network. Users (directly or through their initial access provider) should have nondiscriminatory access to necessary network addresses. Overall administration of network address resources should be by a disinterested party. It would be desirable for users to be able to retain their network addresses regardless of their choice of service provider, and when economically and technically

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feasible, that a single network address provide access to each user, regardless of location or service provider at any time.

### New York's Cable-Telephone Opportunity

One particular interconnectivity issue is the relationship between New York's cable television and telephone networks. Nationwide, these networks together represent nearly a quarter of a trillion dollars of investment whose existence can be the launch point for future enhancements at a lower cost and more immediate and widespread availability.

The cost of widely deploying fiber-optic cable has been disputed. Some have estimated costs in excess of \$140 billion; others estimate that the incremental cost of a broadband network could be as low as \$23 billion over 20 years. Typically, New York State accounts for 10 percent of nationwide estimates. Similarly, the costs of retrofitting cable television networks with digital switches and other capabilities that enable telephone communications could be large. Each group of players—the telephone companies and the cable companies—has a key piece of an overall broadband network already in place. Thus, policies to facilitate competition, interconnectivity, and openness in the network take on particular significance as applied to telephone and cable companies, as the potential exists to save billions of dollars and arrive at a broadband network significantly sooner through a "hybrid" network approach.

However, the rules under which cable and telephone companies currently operate in their traditional markets differ considerably, raising significant issues over the potential application of interconnection, unbundling, and common carriage rules to traditional cable services. Some forms of resale of each other's networks may raise issues of continuing bottleneck and require safeguards to assure reasonable treatment of customers with respect to pricing, service quality, and program diversity. As these networks, industries, and market structures continue their dramatic evolution toward integrated provision of voice, video, and data services in competitive markets, these issues and existing regulatory models will need to be thoroughly examined. The Exchange recommends that the Public Service Commission carefully monitor developments in markets and networks and take direct steps or recommend to federal authorities such measures as are necessary to achieve the potential benefits of synergies and complementary networks, while encouraging competitive service delivery, open programming opportunities, and the free flow of information.

*Regulatory policies should promote maximum choice by end users.*

### Carrier Obligations and Rights

Regulatory policies should promote maximum choice regarding both the reception and the dissemination of information by end users, by ensuring that any citizen or institution is able to originate, find, and access informa-

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tion anywhere on the network. Common carriers serving the public must be precluded from interfering with or restricting the flow of information content over their networks. The Public Service Commission's common carrier rules obligate any telephone corporation providing telecommunications transport services to the general public to carry and deliver to its intended destination any information traffic tendered to it without discrimination based on the source or content of that information traffic.

Carriers providing users' initial access to the network of networks should be required to provide standard access to local emergency services, e.g., 911, at no charge. They should also be obligated to provide access to a voice/nonvoice relay service at no charge beyond normal usage charges.

Each carrier must have the opportunity to be fairly compensated for any services or facilities it provides in a multicarrier communications transaction. Intercarrier agreements should be the first option in establishing appropriate compensation arrangements. Regulatory intervention may be required when a carrier, particularly one with dominant market power (general or situational), declines to enable reasonable compensation or attempts to impose unreasonable charges on users or other carriers. Compensation arrangements should be designed to minimize user inconvenience. The policies described above will advance the goal of a fully integrated network of networks capable of serving all consumers' telecommunications needs in the most efficient, cost-effective manner.

**Protecting Privacy**

Evolving technologies and the open, fully integrated network of networks envisioned here offer tremendous opportunities for the acquisition, storage, retrieval, and sharing of information, but they also pose increasingly worrisome threats to individual privacy. Emerging telecommunications technologies and services significantly contribute to the abilities of governments, businesses, and others to pry into almost all aspects of our lives. ~~Protecting personal privacy interests, without foregoing the benefits of new services, must be a critical component of New York's telecommunications policy.~~

*Protecting personal privacy must be a critical component of New York's telecommunications policy.*

Privacy in telecommunications is not a new concern; but until recently it has been largely a question of protecting the privacy of conversations, for example, preventing eavesdropping or wiretapping. Modern technologies and their uses are now creating concerns about privacy that extend beyond the content of conversations to other information generated through the use of telecommunications. For example, modern signaling systems that can transmit with each call an identification of the line from which it was placed make possible a number of potentially useful call-handling and routing services, e.g., selective call rejection, selective call transfer, Caller ID, automatic call return. However, without appropriate safeguards, this information can also help the called party (or others) identify the caller's

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name and location or develop personal profiles, such as financial status, purchasing habits, and political or social affiliations. Emerging personal communications technologies may enable databases in the network or networks (and anyone with access thereto) to track our movements. Systems being developed to provide on-demand video services could be used to record our viewing habits. Computer-based telecommuting applications might enable employers to monitor each keystroke of our work performance. Every electronic purchase or information selection we make could become an entry in an electronic dossier of our personal preferences, habits, and associations.

Increased use of telecommunications to access information, to obtain entertainment, to purchase goods and services, to improve healthcare or education, to work, or simply to communicate with others must not come at the price of reduced privacy. Such a price would diminish both the quality of our lives and the value of telecommunications services themselves. Public policy must strive to maximize users' control of telecommunications services and personal information related to their use.

The Public Service Commission has established the following set of privacy principles for regulated carriers:

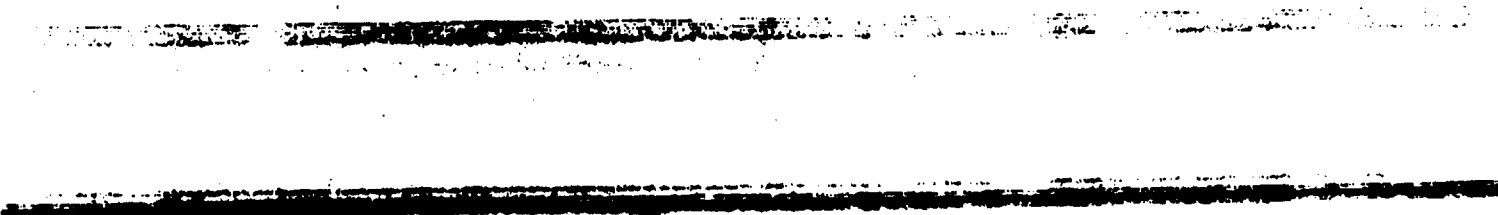
1. Privacy should be recognized explicitly as an issue to be considered in introducing new telecommunications services.
2. The interest in an open network should be recognized in evaluating alternative means for protecting privacy.
3. Companies should educate their customers as to the implications for privacy of the services they offer.
4. People should be permitted to choose among various degrees of privacy protection, with respect to both the outflow of information about themselves and the receipt of incoming intrusions.
5. A telephone company offering a new service that compromised current privacy expectations would be obligated to offer a means of restoring the lost degree of privacy unless it showed good cause for not doing so.
6. Considerations of cost, public policy, economics, and technology all bear on the pricing of privacy features, which must be determined case by case.
7. Unless a subscriber grants informed consent, subscriber-specific information generated by the subscriber's use of telecommunications ser-

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vices should be used only in connection with rendering or billing for those services or for other goods or services requested by the subscriber.

8. Privacy expectations may change over time, requiring, in some instances, changes in telecommunications services. At the same time, changes in telecommunications technology services and markets may lead to changes in customers' privacy expectations.

These principles provide a sound policy foundation. Their force and effect might be strengthened by legislative enactment. Due to the limits of the Public Service Commission's jurisdiction, the privacy protections embodied in these principles apply only to the services of regulated network providers. Privacy issues related to other communications-related services may require broader legislative solutions.



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## 5. Ensuring Affordable, Universally Available Basic Service

Universal access to basic telephone service has been a long-standing objective of state and federal policymakers. Given the critical contribution telecommunications makes to both the state's and the nation's economic, physical, and social well-being, universal service must continue to be a central goal of New York's telecommunications policy. As technology enhances our available telecommunications capabilities, we must ensure that the package of basic services we seek to have universally available continues to meet our citizens' expanding needs. As local service markets become more competitive, we must ensure that this basic package is both ubiquitously available and universally affordable. Further, we must ensure that all service providers equitably share the responsibility for maintaining universal service.

*Universal service must continue to be a central goal of New York's telecommunications policy.*

Universal service defines the basic form of access that all citizens, businesses, and other users should have to the network of networks. It can determine the level of our access to information and the richness of our communications. A definition that is not sufficiently robust can create an undesirable gap between information haves and have-nots, and, given the importance of telecommunications to the state's economy, it can also have adverse economic impacts. Yet an overly rich definition can be expensive and can itself impede economic growth by providing services that are neither used nor desired. Thus, a delicate balance needs to be struck.

Today's basic service package comprises a residence exchange access line (generally one-party, analog, rotary dial), access to local and toll calling, access to emergency calling (e.g., 911), and access to the voice/nonvoice relay system. To promote universal access to this package, it has been the policy of regulators to subsidize it, if and where necessary, for residence subscribers generally. To further ensure its affordability to the economically disadvantaged, the Lifeline and Link-Up programs established by federal and state regulators make this service package available to recipients of selected public support programs for as little as \$1 per month.<sup>30</sup>

What constitutes the basic service package will continue to evolve as new technologies and services become available. When and where markets are competitive, consumers will define this package of services through their purchasing decisions, and competing providers, in order to grow, will attempt to expand that definition by offering additional services. However, policymakers must periodically reassess the definition of basic service to ensure that, in all areas and communities where effective competition has not developed, affordable access to necessary telecommunications capabilities continues to be available. Whereas today's universal service encompasses only voice and low-speed data transmission capabilities, in the future it may need to include higher-speed data and even video transmission capabilities. Rather than define a particular set of basic service



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capabilities for the near term, policymakers should first focus on developing informed criteria by which to assess future basic service alternatives. Such criteria might include, for example, the level of demand for a service or capability, its potential for social benefit, and its cost.

Universal access policies must also recognize the needs of special communities. For example, to realize the benefits of universal access, many New Yorkers with disabilities need special equipment—equipment that often they cannot afford. The New York Department of Social Services operates a low-cost, equipment loan fund, a portion of which finances telecommunications equipment. Because it is underfunded and because it has a default rate of approximately 20 percent, the equipment loan fund currently cannot meet existing demand.

Market forces alone may not achieve an acceptable level of basic service access and affordability for all citizens. New telecommunications services will be provided first in those areas in the state where they will be most profitable, and they will be provided later, if at all, in less profitable areas. Even where new services are available, there may be some citizens for whom such services are not affordable. Thus, as telecommunications markets become increasingly competitive, one policy challenge will be to ensure that everyone continues to receive, at an affordable price, the level of telecommunications access and service delivery required for full participation in the social and economic mainstream.

*Market forces alone  
may not achieve an  
acceptable level of basic  
service and  
affordability.*

New York's commitment to the nation's historic policy of promoting universal telephone service is manifested primarily by the Public Service Commission's comprehensive telephone Lifeline program. Of the million or more low-income New York families that qualify for telephone Lifeline assistance, more than half a million are already enrolled and connected to the public switched network. In New York basic local exchange telephone service, as currently specified by the Public Service Commission, remains an available and affordable reality for every household.

Lifeline program costs to local exchange providers are currently recovered in each local exchange company's revenue requirements. Local exchange company costs for network services, and for network functions needed by other carriers often include some contribution toward the costs of residential access, Lifeline, 911, the statewide relay service, and provider-of-last-resort obligations.<sup>31</sup>

Emerging state and federal open network architecture and collocation policies, continuing technological advances, and competitive pressures will reduce the number of monopoly bottleneck services and will create new challenges—and opportunities—for the Public Service Commission to maintain its policy on universally available and reasonably affordable residential service.

While competition may succeed in decreasing costs and prices for telecommunications services, emerging technology will continue to expand the breadth of services that each household must have for participa-